SIGHT PIN FOR ARCHERY BOW

This application claims priority from U.S. Provisional Application Ser. No. 60/249,564, filed November 17, 2000, the disclosure of which is hereby incorporated by reference.

FIELD OF THE INVENTION

This invention relates generally to sight pins for archery bows, and more particularly to a sight pin having an optical fiber disposed therein that provides an aiming indicia.

BACKGROUND OF THE INVENTION

Sight pins are commonly used in archery bows, either singly or in multiple units, to provide aiming indicia for an archer. Typically, the pins are vertically adjustable so that the archer can control the vertical position of the aiming indicia as a function of target distance.

More recently, light-gathering fluorescent fibers having spaced apart ends at which light gathered along exposed longitudinal surfaces of the fiber is emitted at the ends of the fiber to provide a bright dot, have been mounted in archery pins. The small dots are readily observable when the axis of the end portion of the fiber is aligned with the user's eye.

In previous attempts to mount light-gathering flourescent fibers in an archery pin, one end of the fiber has been mounted in a hole provided in the distal end of the pin and a second end of the fiber has been inserted through a base portion of the pin or received within a groove or ring provided on the base portion of the pin. In these arrangements, the second end of the optical fiber is also exposed. Such arrangements are not only distracting, with two aiming indicias mounted on the same pin being visible, but can actually lead to confusion and distraction, which result in decreased concentration on the correct exposed optical fiber end.

Therefore, it is desirable to have an archery pin for a bow in which only one end of an optical fiber is viewable by the archer. It is also desirable to have such a pin in which the light gathering optical fiber emits light that provides a bright aiming indicia even under low light conditions.

SUMMARY OF THE INVENTION

The present invention is drawn to a sight pin assembly having an optical fiber wherein only one end of the optical fiber is viewable by the archer, and can optionally incorporate a light emitting member to provide a bright aiming indicia under low light conditions. The sight pin assembly includes an elongate pin having a first end and a second end. An elongate light-

gathering optical fiber has a first end supported at the first end of the elongate pin such that it is visible when viewing a front of the elongate pin. The second end of the light-gathering optical fiber is supported at a second end of the elongate pin and obscured from view when viewing the front of the elongate pin.

The light-gathering optical fiber is received in the second end of the elongate pin. The elongate pin has a cavity in the second end and the second end of the light-gathering optical fiber is received within the cavity. The cavity contains a light emitting member disposed adjacent the second end of the light-gathering optical fiber. The light emitting member may be tritium. At least a portion of the cavity is threaded for attachment to a pin holder of an archery bow sight. The light-gathering fiber enters the second end of the elongate pin at an obtuse angle to an axis of the elongate pin as measured between the second end of the elongate pin and the light-gathering optical fiber. Alternately, the light-gathering optical fiber enters the second end of the elongate pin at a right angle to an axis of the elongate pin. This can be concentric about an elongate cavity which is perpendicular to the axis of the elongate pin. A support fin can extend outwardly from the elongate pin which bridges a space between the light-gathering optical fiber and the elongate pin. The second end of the elongate pin may have a rectangular cross-section.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, Fig. 1 is a top view of an archery pin assembly embodying the present invention, showing the archery pin assembly secured in a pin holder that is mountable on a bracket that is attachable to a bow, the pin holder being shown in section;

Fig. 2 is an end view of the archery pin illustrated in Fig. 3, embodying the present invention;

Fig. 3 is a side view of the archery pin illustrated in Fig. 1, embodying the present invention;

Fig. 4 is a perspective view of a colored flourescent optical fiber having a clear core;

Fig. 5 is a cross-sectional view of an alternate embodiment of the archery pin assembly embodying the present invention; and

Fig. 6 is a cross-sectional view of an alternate embodiment of the archery pin assembly embodying the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the illustrated embodiment, a sight pin for an archery bow is generally indicated in the drawings by the reference numeral **10**. The pin **10** shown in Fig. 1 is secured on a pin holder **12** that is attachable to an archery bow, not shown. The pin holder **12** has a vertical slot **14** that permits the pin **10** to be adjusted vertically along the slot **14**. The slot **14** has an enlarged opening **16** at the pin side of a slot that it is sized to intimately receive a square or rectangular

shank **18** of a base portion **20** of the pin **10,** and thereby inhibit rotation of the pin **10** within the enlarged opening **16** of the slot **14**. At an opposite end of the slot **14**, an enlarged opening **22** is provided to receive a washer **24** or screw head therein. The pin **10** is adjustably secured to the pin holder **12** by a threaded adjusting screw **26** that engages threads provided in a threaded cavity **28** extending inwardly into the base portion **20** from an end wall **30** of the base portion **20**. Tightening the adjusting screw **26** pulls the base portion **20** of the pin **10** into fixed contact with the pin holder **12**, with the shank portion **18** of the base portion **20** non-rotatably seated and fixed in the slot **14**. By loosening the adjusting screw **26**, the position of the pin **10** can be adjusted vertically whereupon, when the pin **10** is at the desired position, the adjusting screw **26** is again tightened.

The pin **10** is conventionally formed of metal, plastic, or a combination of metal and plastic. If a combination one portion of the pin **10**, e.g., the base portion **20**, is formed of plastic and the remaining portion, i.e., a sighting indicia support portion **32** extending outwardly from the base portion, is formed of metal. As described above, desirably at least the base portion **20** of the pin **10** has a square or rectangular external shape to provide flat surfaces that engage the slot **14** whereby rotation of the pin **10** is prevented when the adjusting screw **26** is tightened.

A distal end **34** of the support portion **32** has an aperture **36** that is sized to intimately receive a first end **38** of an elongated light-gathering optical fiber **40**. A support fin **41** bridges the space between elongated light-gathering optical fiber **40** and the pin **10** to provide support to the fiber **40**. The support fin 41 can be constructed of either plastic or metal.

Light-gathering optical fibers gather light along exposed circumferential surfaces of the optical fiber and focus the gathered light onto the end faces of the fiber. In the present invention, the exposed circumferential surface of the optical fiber **40** is generally indicated by the reference numeral **42**. The light gathered through the exposed circumferential surface **42** is directed to the first end **38** of the optical fiber whereat the end face provides a brilliant dot, especially when the optical fiber **40** has fluorescent properties, for use by an archer as an aiming indicia. Light gathered through the exposed circumferential surface **42** is also directed to a second end **44** of the optical fiber **40**, which is disposed within an end portion **45** of the threaded cavity **28** provided in the base portion **20** of the pin **10**. As best shown in Fig. 1, a portion of the optical fiber **40** adjacent the second end **44** is disposed within an elongated aperture **46** extending between the end portion **45** of the threaded cavity **28** and an external surface of the pin **10**. The elongated aperture **46** is preferably disposed at an obtuse angle α with respect to a longitudinal axis **48** of the threaded cavity **28** to avoid sharp bends in the optical fiber **40**. Thus, the light directed to the second end **44** of the optical fiber is effectively blocked from view by the archer, thus avoiding any distraction or other impediment to the archer from focusing his sole attention on the bright dot at the first end **38** of the optical fiber **40**.

To more clearly illustrate the pin **10**, the optical fiber **40** is not shown in Figs. 2 and 3. However, when the present invention is considered as a pin assembly, the assembly includes not only the pin **10**, but also the optical fiber **40** mounted within the pin as illustrated in Fig. 1.

It should also be recognized that, if desired, a light emitting source, such as a capsule containing a phosphor and a radioactive gas, e.g., tritium gas, could be disposed in the end portion **45** of the threaded cavity **28** at a position adjacent to and touching or slightly offset from the second end **44** of the optical fiber **40**. If the light source is not touching the fiber **40**, a distance of within approximately 0.01 inches is preferred, though greater offsets are operable and within the scope of this invention. Such an arrangement provides an additional light source for use of the pin **10** under very low light conditions when the ambient light gathered through the circumferential surface **42** of the light gathering flourescent optical fiber **40** may be diminished. Further, in situations where a light source is utilized, a clear optical fiber, colored optical fiber, or an optical fiber **40** having a clear core with an colored exposed circumferential surface **42**, for example a colored flourescent cladding, (FIG. 4), can be used. When using a light source, the fiber **40** having a clear core and colored circumferential surface **42** is preferred. The clear core ensures maximum transmission of light from the light source through the optical fiber **40** in low light conditions, while the colored circumferential surface **42** produces a colored aiming indicia in moderate to bright lighting.

In an alternate embodiment, illustrated in Fig. 5, a pin **10'** has a stepped second elongated aperture **50** disposed at substantially a 90° angle with respect to the longitudinal axis **48'** of threaded cavity **28'**. In this arrangement, the elongated aperture **50** extends horizontally through the base portion **20'** of the pin **10** with the end of the aperture **50**, facing an archer, plugged with a cap **52** to prevent visual observation of the second end **44'** of the optical fiber **40'**.

The cap **52** can thread into the base portion **20'** or can be retained frictionally or with an adhesive. Also, the cap **52** can optionally contain a light source **54** which transmits light into the end **44'** of the optical fiber **40'**. In this arrangement, the light source **54** may comprise a vial or bulb containing a phosphor and tritium in a gaseous state. It is preferable that the light source **54** by optically coupled, for example through a lens or transparent glue, or within 0.01 inches of the end of the fiber **40'** to ensure the optimum transmission of light into the fiber **40'**. Distances greater than 0.01 inches have been found to be operable and are within the scope of this invention. It is also preferable that the centerline of the light source **54** be substantially aligned with the center line of the fiber **40'** to ensure transmission of light from the light source **54** into the optical fiber **40'**.

FIG. 6 depicts a detail of the pin **10'** utilizing an alternate configuration of light source **54"**. As above, light source **54"** can be contained in a cap **52"**; however, in this embodiment the light source **54"** is surrounded by a white protective sleeve **56.** The protective sleeve **56** can be, for example, a polymer material adapted to cushion the light source **54"** from impact and prevent breakage. Because sleeve **56** is white, it tends to reflect light from the light source **54"** inward toward optical fiber **40'**. Sleeve **56** can be retained in the cap **52"** with an adhesive **62.**

Additionally, cap **52"** can incorporate a lens **58** between the light source **54"** and the second end **44** of the optical fiber **40'.** Lens **58** can be configured to focus light from the light source **54"** into the fiber **40'**. In a preferred embodiment the lens **58** is a hard transparent

material, for example a saphire lens, that in additional to its optical properties, serves to shield the light source **54"** from intrusion by the second end **44** of optical fiber **40'**. Alternately, lens **58** can be an optical connector such as a deposit of transparent silicon, acrylic, glue or other transparent substance that transmits or focuses light from the light source **54"** into the fiber **40** and protects the light source **54"**.

Referring again to FIG. 1, a preferred method for assembling the pin **10** with the optical fiber **40** is hereinafter described in detail. One skilled in the art will appreciate that the preferred method of assembly described herein applies to each of the embodiments described herein and depicted in FIGS. 1-6. First, the second end **44** of a length of optical fiber **40** is flared such that the diameter of the optical fiber **40** at the second end **44** is slightly greater that the diameter of the elongate aperture **46.** The first end **38** of optical fiber **40** is then inserted into the elongate aperture **46** from inside the threaded cavity **28.** The fiber **40** is pulled though the elongate aperture **46** until the second end **44** frictionally lodges in the aperture **46**. If needed, an adhesive can be provided on the flared second end **44** to additionally secure the second end **44** in the elongate aperture **46.** Also, the aperture can have a chamfered edge (best seen in FIG. 6 with respect to aperture **50** and chamfer **60**). One of ordinary skill in the art will appreciate that in an embodiment utilizing a light source **54** (FIGS. 5 and 6) the flared second end **44** can act to collect and direct more light into the optical fiber **40.**

With second end **44** secured in the aperture **46**, the first end **38** is then inserted through the aperture **36** in the support portion **32** of the pin **10**. The optical fiber **40** is then

trimmed at the first end **38** to an appropriate length. The fiber **40** is preferably trimmed to a length that allows the fiber **40** to arc substantially smoothly from the elongate aperture **46** to the aperture **36** of the support portion **32** without kinking. If a support fin **41** is provided, the length of the fiber **40** should allow the fiber **40** rest on the fin **41** substantially without slack in the fiber **40.** Slack in the fiber **40** may allow the fiber **40** to shift and impact and possibly damage the light source **54.**

After the optical fiber **40** is trimmed, its first end **38** is then inserted through the aperture **36.** The first end **38** is then flared to be frictionally retained in the aperture **36** of the support portion **32,** and such that the optical fiber **40** is substantially without slack. One of ordinary skill in the art will appreciate that flaring the first end **38** of the optical fiber **40** can increase the size of the brilliant dot seen by the user.

It is to be understood that while the invention has been described above in conjunction with preferred exemplary embodiments, the description and examples are intended to illustrate and not limit the scope of the invention. Thus, the scope of the invention should only be limited by the following claims.